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RV *Investigator* CTD Data Processing Report

Voyage ID	IN2026_V04
Voyage Title	Quaternary evolution of the Darumbal & Woppaburra Sea Country in the Southern Great Barrier Reef
Depart	Brisbane, 28 July 2026, 04:00 UTC
Return	Brisbane, 19 August 2026, 22:00 UTC
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1 Summary

This voyage took place in the Southern Great Barrier Reef (SGBR) with four primary objectives:

1. Characterise the Quaternary evolution of Darumbal and close neighbour Woppaburra Sea Country and integrate with traditional knowledge to contribute to understanding the cultural heritage values of the SGBR,
2. Assess the Quaternary evolution and development of the coral reefs in the SGBR,
3. Study the interaction of the modern ocean currents with the reefs and seascape of the SGBR – to help validate and improve eReefs models, and
4. Atmospheric measurements for the SGBR will contribute to the Reef Restoration Adaptation Project (RRAP).

CTD and Triaxus data for this voyage were primarily collected to support the third objective.

There have been few dedicated voyages or oceanography research on the SGBR and only limited observational data available to validate the CSIRO eReefs Model that is used to manage the area. There is also limited information of subsurface processes (such as uplift – upwelling that doesn't reach the surface). The exchange of water between the East Australian Current which flows around the Swain Reefs and the influence of the Capricorn Eddy, a lee eddy in the Capricorn Channel, is poorly studied. This region has been proposed as a potential refugia for coral reefs under future climate change however it also remains under studied. Thus, improving our understanding of the oceanographic processes in the region and testing the eReefs model is critical to assess this refugia hypothesis and manage the region appropriately.

This report describes the production of quality controlled, calibrated CTD data from RV *Investigator* voyage IN2026_V04.

Data for 58 CTD deployments were acquired using the Sea-Bird SBE911 CTD unit #1039, fitted with 36 twelve-litre bottles on the rosette sampler. Sea-Bird-supplied calibration factors were used to compute the pressures and preliminary conductivity values. CSIRO-supplied calibrations were applied to the temperature data. The data were subjected to automated QC to remove spikes and out-of-range values.

No nitrate data was collected on cast #1.

No bottles were fired on casts #8, #16, #32-34 and #38.

A spooling issued occurred during the upcast of cast #58. The processed (downcast) data for the cast was not affected.

The final conductivity calibration was based on a single deployment grouping. The final calibration from the primary sensor had a standard deviation (SD) of 0.0013896 PSU, within our target of 'better than 0.002 PSU'. The standard product of 1-decibar binned averages were produced using data from the primary sensors.

The dissolved oxygen data calibration fit had a SD of 0.74371 μM . The agreement between the CTD and bottle data was good.

PAR, altimeter, transmissometer and Eco triplet (CDOM, Chlorophyll-a, scattering) sensors were also installed on the auxiliary A/D channels of the CTD, and a SUNA sensor via serial connection. To access the full voyage plan and other reports and data associated with this voyage, please see the contact information at the end of this report.

1.1 Voyage Track

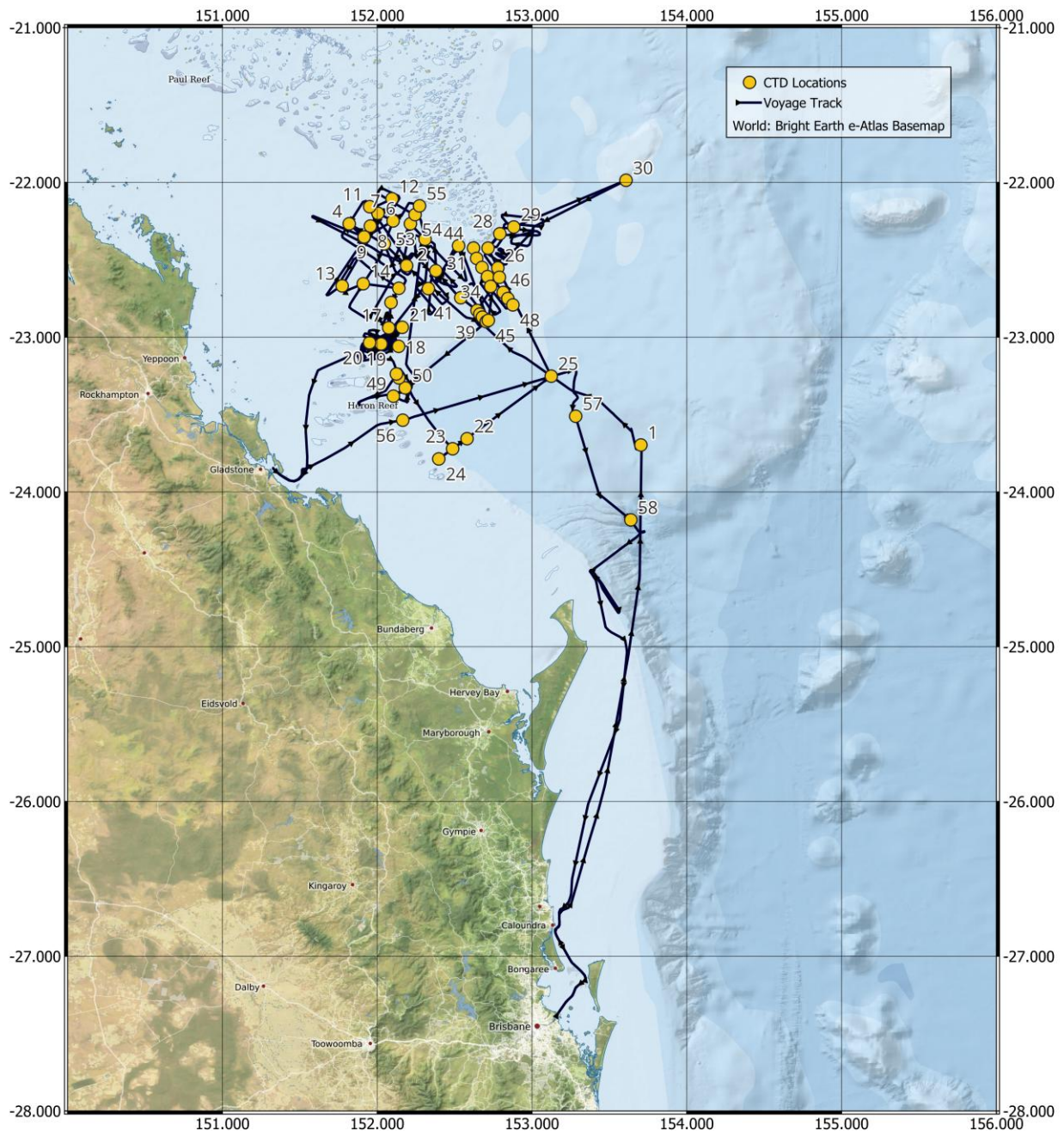


Figure 1: Voyage track with CTD cast locations

2 Data Processing

2.1 Background Information

58 CTD deployments were conducted on this voyage. The data were acquired with the CSIRO CTD unit #1039, a Sea-Bird SBE911 with dual conductivity and temperature sensors.

The CTD was additionally fitted with SBE43 dissolved, PAR, altimeter, transmissometer, ecotriplet (CDOM, Chlorophyll-a, scattering), and SUNA sensors. These sensors are described in Table 1.

Sensor Description	Model	Serial No.	A/D Channel	Calibration Date	Calibration Source
Pressure	DigiQuartz 410K-134	1039	P	23-Jun-2026	CSIRO CAL-LAB
Primary Temperature	Sea-Bird SBE3 <i>plus</i>	6180	T0	5-Jun-2026	CSIRO CAL-LAB
Secondary Temperature	Sea-Bird SBE3 <i>plus</i>	5932	T1	5-Jun-2026	CSIRO CAL-LAB
Primary Conductivity	Sea-Bird SBE4C	3868	C0	16-Jun-2026	CSIRO CAL-LAB
Secondary Conductivity	Sea-Bird SBE4C	3168	C1	8-Apr-2026	SEA BIRD
Primary Dissolved Oxygen	SBE43	4167	A0	30-May-2026	SEA BIRD
Secondary Dissolved Oxygen	SBE43	4188	A1	30-May-2026	SEA BIRD
PAR	Biospherical QCP2300HP	70562	A2	11-Aug-2025	BIOSPHERICAL
Altimeter	Tritech PA500	228403	A3	11-Sep-2024	TRI-TECH
CDOM	FLCDRTD	4367	A4	18-Sep-2025	SEA BIRD
Transmissometer	Wetlabs C-Star (DR)	2009	A5	12-May-2025	SEA BIRD
Chlorophyll-a	Wetlabs ECO FLBBRTD	5169	A6	13-Nov-2025	SEA BIRD
Scattering	Wetlabs ECO FLBBRTD	5169	A7	13-Nov-2025	SEA BIRD
Nitrate Sensor	SBE SUNA	1891	Serial	8-Jun-2026	SEA BIRD

Table 1: CTD Sensor configuration on IN2026_V04

Water samples were collected using a Sea-Bird SBE32, 36-bottle rosette sampler. Sampling was from 36 out of the 36 twelve-litre bottles which were fitted to the frame.

The raw CTD data were collected in SBE Seasave version 7.26.7.121, converted to scientific units using SBE Data Processing version 7.26.7.1 and written to NetCDF files with CNV_to_Scan (cnv_to_scan_ui2.py, from the CSIRO MNF Data Acquisition and Processing “marinetech” git repository) for processing using the MATLAB-based CapPro software.

The CapPro software version 2.12 was used to apply automated QC and preliminary processing to the data. This included spike removal, identification of water entry and exit times, conductivity sensor lag corrections, conductivity cell thermal inertia corrections, and the determination of the pressure offsets. It also loaded the hydrology data and computed the matching CTD sample burst data (i.e., averaged sensor data) for water-sample-to-sensor data comparisons. The automatically-determined pressure offsets and in-water points were inspected and verified during data processing.

The bottle sample data were used to compute final conductivity and dissolved oxygen calibrations. These were applied to the data, after which files of binned 1-decibar averaged data were produced.

2.2 Pressure and Temperature Calibration

The pressure offsets for each deployment are plotted in Figure 2. The blue circles refer to initial out-of-water values (beginning of downcast) and the red circles the final out-of-water values (end of upcast).

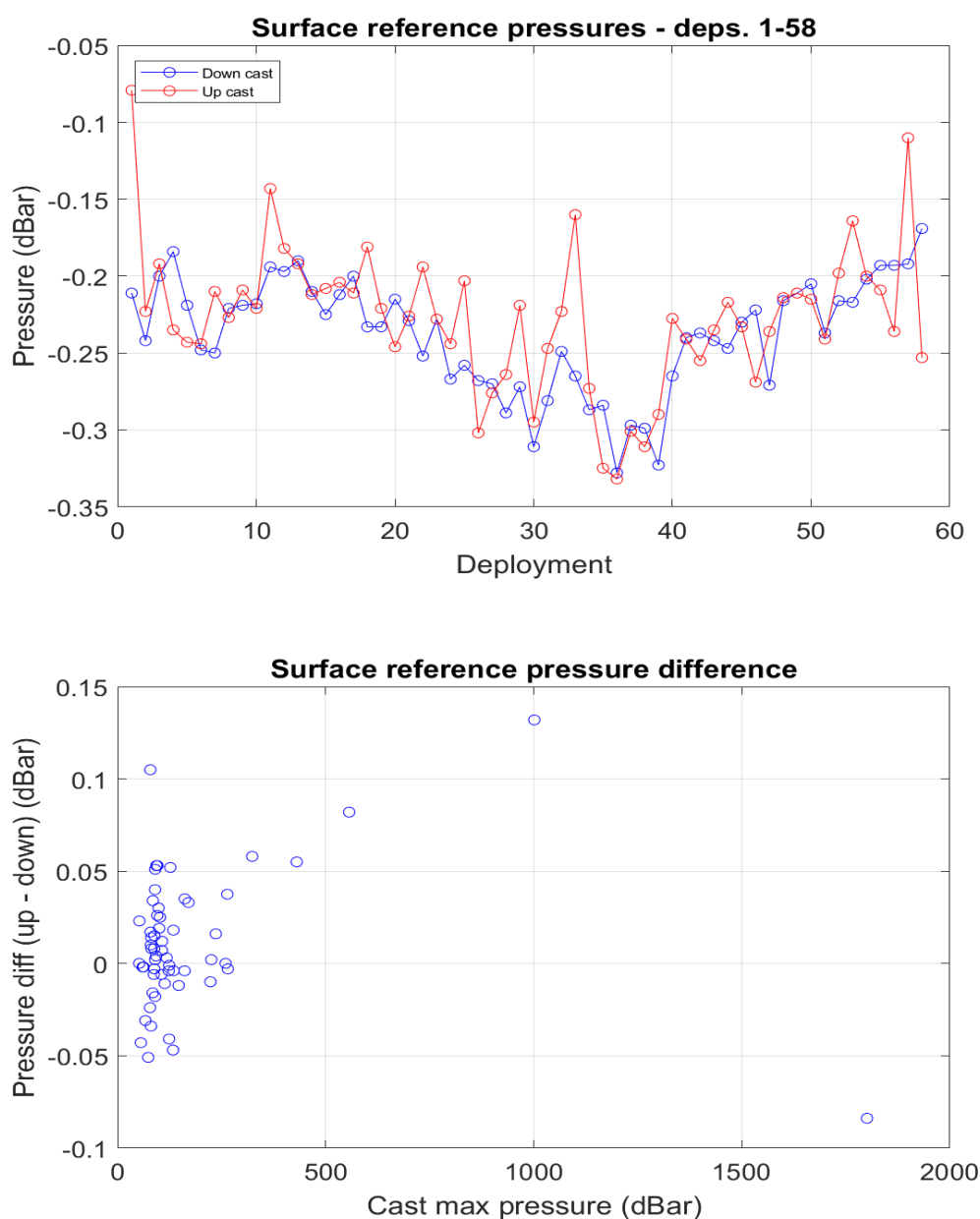


Figure 2: CTD pressure offsets

The difference between the primary and secondary temperature sensors at the bottle sampling depths is plotted in Figure 3. Most deployments plot within ± 0.001 °C of zero – outliers result from sampling in regions of high vertical temperature gradient. The consistent mean difference (red + markers) between the primary and secondary temperature from deployment to deployment indicates neither sensor has drifted significantly from its calibration.

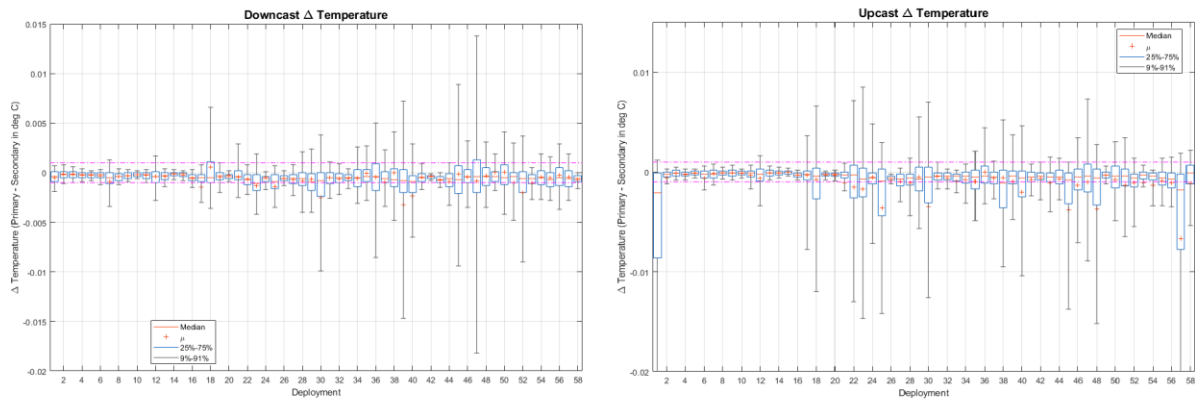


Figure 3: Difference (primary - secondary) between temperature sensor values on downcast (left) and upcast (right)

2.3 Conductivity Calibration

If any discrepancies or sampling problems occurred during bottle salinity sampling or between primary and secondary CTD conductivity measurements, these would show in the conductivity calibration plots in Figure 4. We did not observe sampling problems based on these calibration results. An example of the profile plots showing the thermocline and halocline ranges are shown in Figure 5.

The calibrations were based upon the percent of ‘good’ sample data (123 good samples from the primary unit and 124 good samples from the secondary unit), out of a total of 166 samples taken during deployments. To perform the calibration with the preferred (default) CapPro calibration settings, a minimum of 70% of the samples need to be in the ‘good’ range. If there is an insufficient number of good samples for a unit, the conductivity difference ‘cutoff’ value must be increased to continue with the calibration process in CapPro. For this set of conductivity calibrations, the cutoff values used were 0.003 (primary) and 0.003 (secondary).

Figure 4 plots CTD - bottle salinity differences for both upcast (Hydro bottle) and downcast (CTD SBE43) data. The ‘bad’ outliers (magenta dots, red dots and red + markers) are excluded from the calibration, the ‘suspect’ outliers (blue dots) are used in the calibration but are weighted based on their distance from the mean. All green dots are considered ‘good’ data points and are not weighted based on distance from the mean.

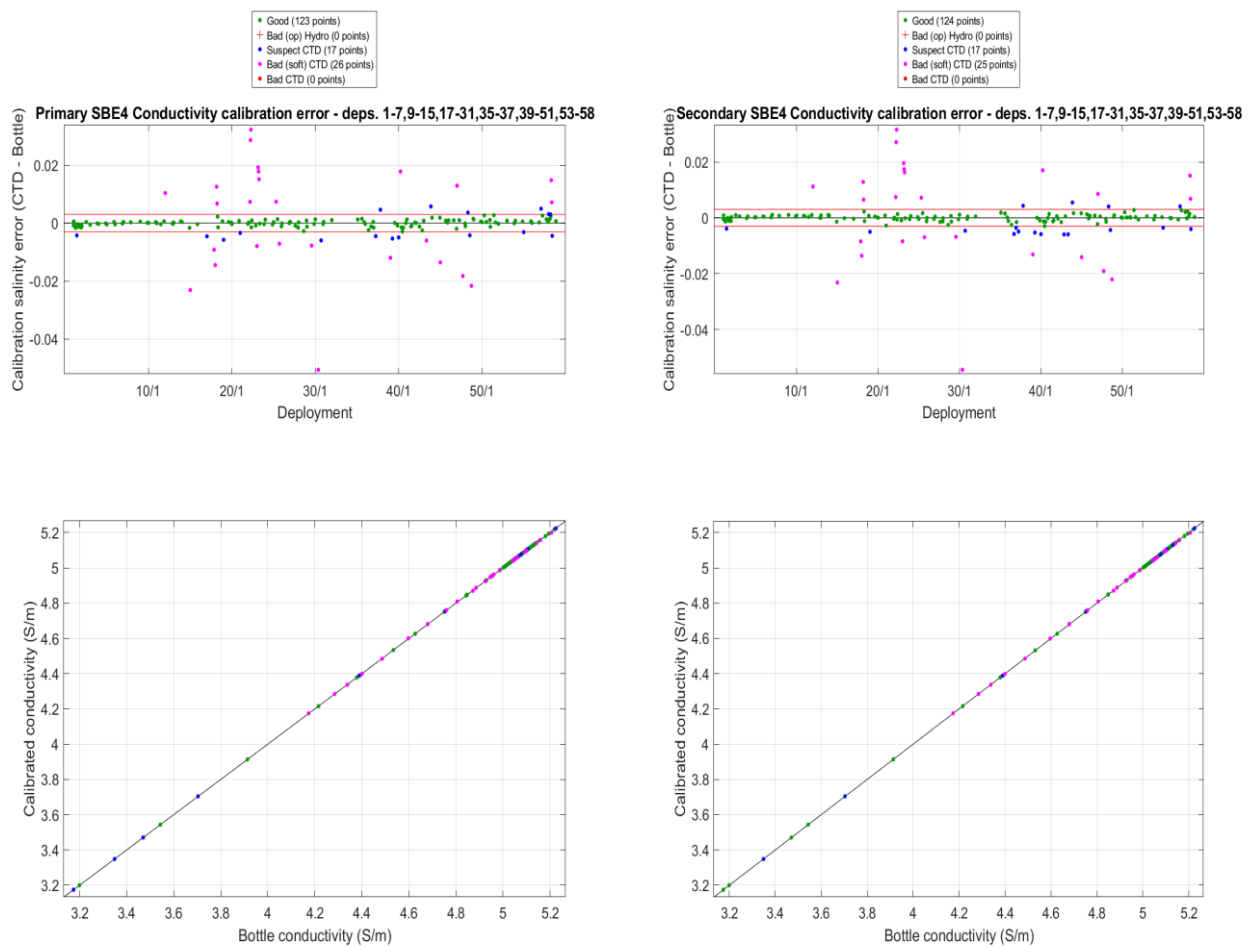


Figure 4: CTD - bottle conductivity difference and salinity calibration error (left: primary, right: secondary)

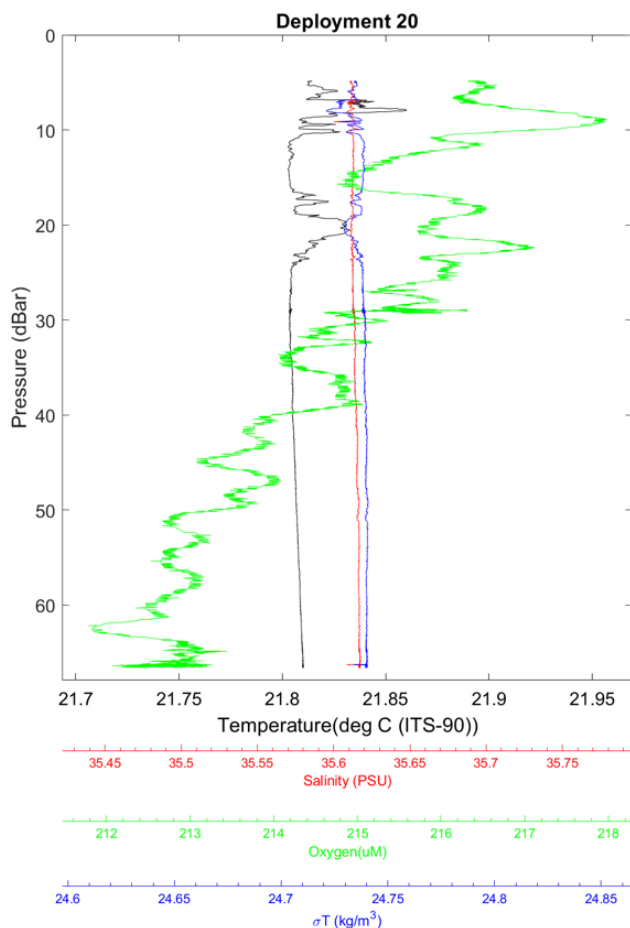


Figure 5: Temperature, salinity, dissolved oxygen and σ_T profiles

The box plot (Figure 6) of calibrated downcast conductivities (primary - secondary) at the bottle sampling depths for all deployments shows that the calibrated primary and secondary conductivity cell responses corresponded reasonably well to each other.

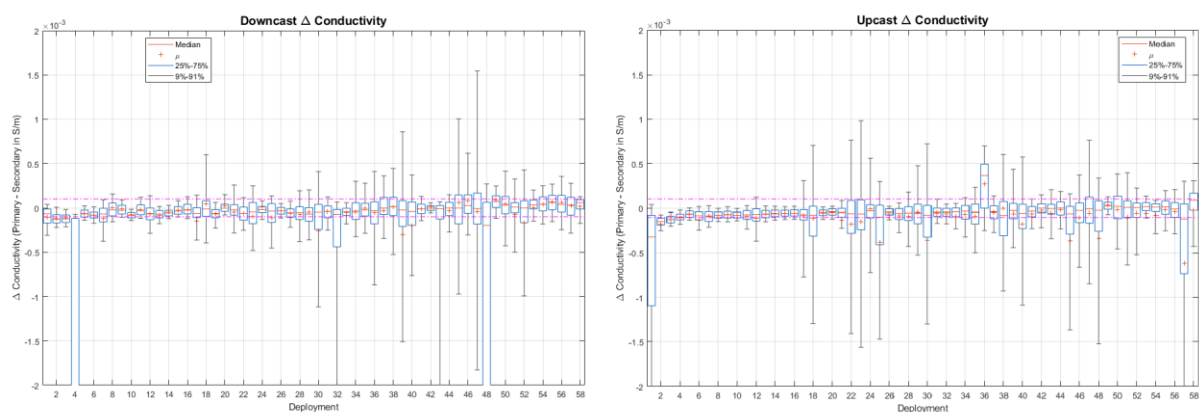


Figure 6: Difference (primary - secondary) between conductivity sensor values on downcast

The final results for the primary and secondary conductivity sensors with respect to their original calibrations are shown in Table 2 and Table 3.

Sensor Group	Deployments	Scale Factor		Offset		Salinity (PSU)	
		a1	±	a0	±	Residual SD	M.A.D.
Primary	1-7,9-15,17-31,35-37,39-51,53-58	0.99959	0.001395	0.0013522	0.0072145	0.0013896	0.00083162
Secondary	1-7,9-15,17-31,35-37,39-51,53-58	0.99988	0.0014211	0.00028177	0.0073497	0.0014666	0.00074298

Table 2: Conductivity calibration with respect to manufacturer's calibration coefficients and post-calibration results

Conductivity Sensor	Deployments	CPcor	±
Primary	1-7,9-15,17-31,35-37,39-51,53-58	-8.1734e-08	7.1323e-07
Secondary	1-7,9-15,17-31,35-37,39-51,53-58	-1.1458e-07	7.2628e-07

Table 3: Calculated CPcor (the correction for pressure effects on the conductivity cell) for primary and secondary conductivity units compared to the manufacturer's nominal value of -9.5700e-08 (for pressure in decibars) (Sea-Bird, 2017)

This is a good calibration. We normally aim for a SD of 0.002 PSU for 'typical' oceanographic voyages. The above calibration factors were applied to the indicated deployments. Full plots of residuals before and after calibration are available in A.1.

Data from the primary conductivity and temperature sensors were used to produce the averaged salinities (these data variables have no suffix) with secondary sensors included with a suffix '_2'.

2.4 Dissolved Oxygen Sensor Calibration

2.4.1 SBE Calibration Procedure

(Sea-Bird, 2013) describes the SBE43 dissolved oxygen sensor as "a polarographic membrane oxygen sensor having a single output signal of 0 to +5 volts, which is proportional to the temperature-compensated current flow occurring when oxygen is reacted inside the membrane. A Sea-Bird CTD that is equipped with an SBE43 oxygen sensor records this voltage for later conversion to oxygen concentration, using a modified version of the algorithm by Owens and Millard (1985)."

Calibration involves performing a linear regression, as per (Sea-Bird, 2012) to produce new estimates of the calibration coefficients *Soc* and *Voffset*. These new coefficients are used, along with the other, manufacturer-supplied coefficients, to derive oxygen concentrations from the sensor voltages.

2.4.2 Results

Deeper casts (>1000m) are known to be affected by pressure-induced hysteresis with this sensor. This is corrected automatically within CapPro using the method discussed in (Sea-Bird, 2014).

There is a small mismatch between downcast and upcast dissolved oxygen due to the response time of the sensor. No correction for the sensor lag effect has been applied.

A single calibration group was used with the associated SBE43 upcast data to compute the new *Soc* and *Voffset* coefficients. Figure 7 plots CTD SBE43 - bottle oxygen differences for both upcast (Hydro bottle) and downcast (CTD SBE43) data. The 'bad' outliers (magenta dots, red dots and red + markers) are excluded from the calibration, the 'suspect' outliers (blue dots) are used in the calibration but are weighted based on their distance from the mean. All green dots are considered 'good' data points and are not weighted based on distance from the mean.

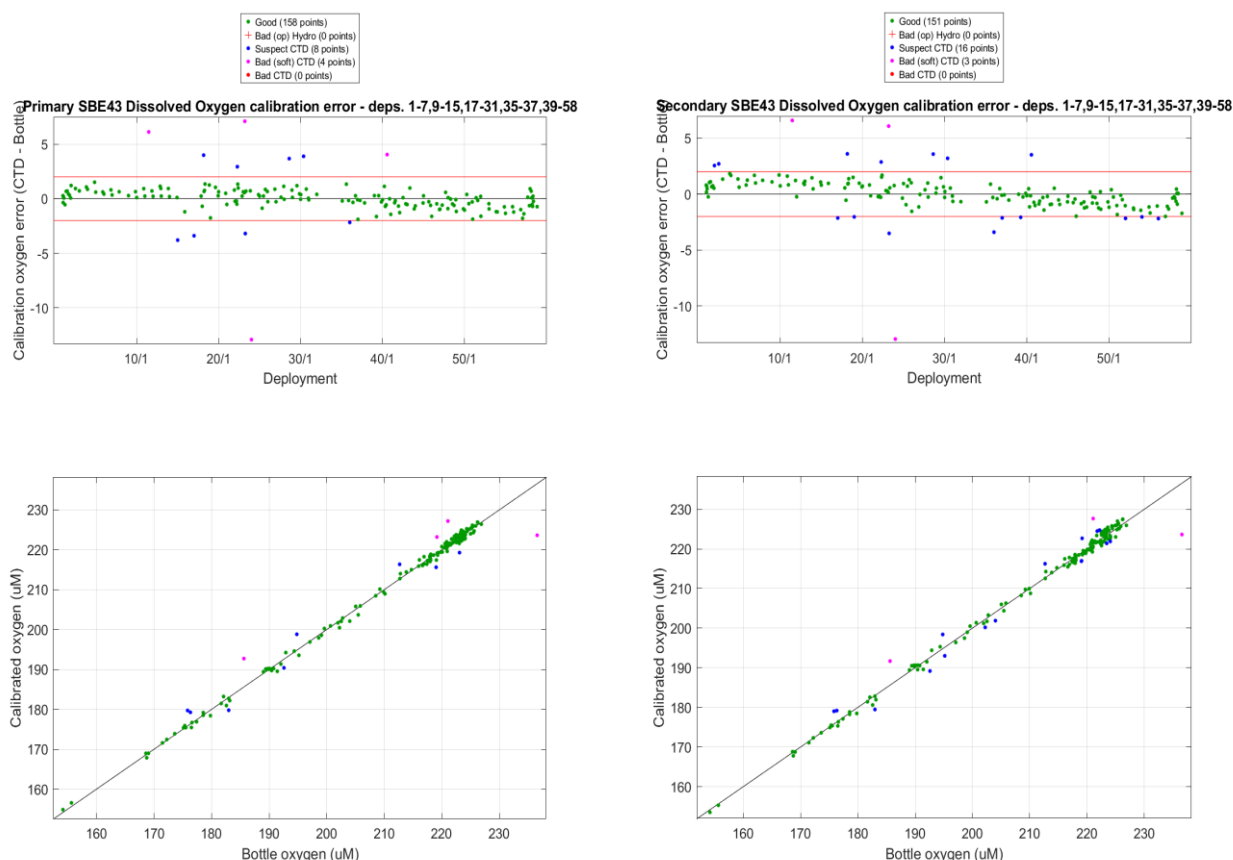


Figure 7: CTD SBE43 - bottle dissolved oxygen difference and calibration error (left: primary, right: secondary)

The box plot (Figure 8) of calibrated downcast dissolved oxygen readings (primary - secondary) at the bottle sampling depths for all deployments shows that the calibrated primary and secondary dissolved oxygen sensor responses corresponded reasonably well to each other.

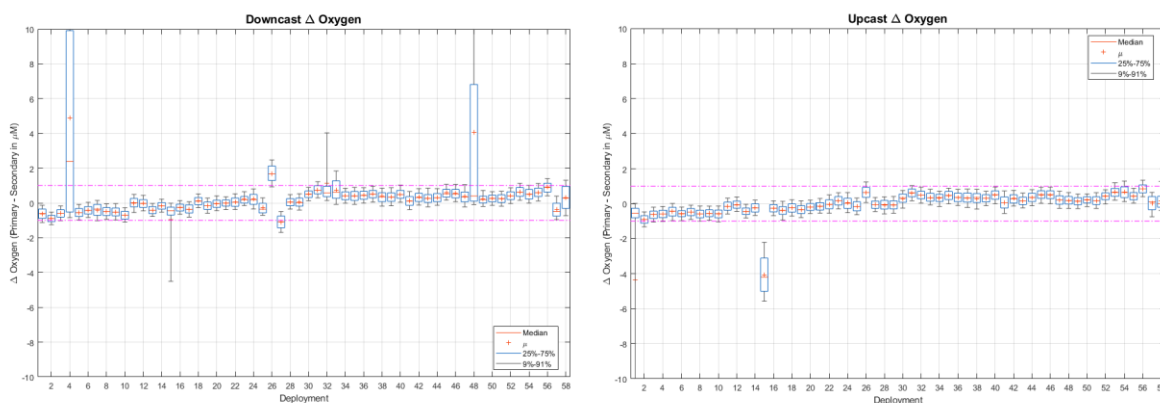


Figure 8: Difference (primary - secondary) between dissolved oxygen sensor values on downcast

The old and new *Soc* and *Voffset* values for DO sensors are listed in Table 4. The *Soc* value is a linear slope scaling coefficient; *Voffset* is the fixed sensor voltage at zero oxygen. Full plots of residuals before and after calibration are available in A.2.

The calibrations were applied for each sensor and the averaged files were created using the result from the primary sensor.

Sensor	Calibration Source	Deployments	Calibration Coefficients				Dissolved Oxygen (μM)	
			<i>Voffset</i>	±	<i>Soc</i>	±	Residual SD	M.A.D.
Primary DO	CapPro	1-7,9-15,17-31,35-37,39-58	-0.66653	0.0047606	0.45952	0.0011376	0.74371	0.6145
	Sea-Bird	1-58	-0.707		0.4506			
Secondary DO	CapPro	1-7,9-15,17-31,35-37,39-58	-0.50552	0.004778	0.57186	0.0017662	0.76455	0.80726
	Sea-Bird	1-58	-0.5153		0.5597			

Table 4: Dissolved oxygen calibrations

2.5 Other Sensors

2.5.1 C-Star Transmissometer

The C-Star transmissometer was used on all deployments. It was calibrated by the manufacturer with meter outputs with the beam blocked, in air with a clear beam path and with clean water in the path. These values are used to determine a scale and offset for use in SBE Data Processing software to convert the raw counts to a beam transmittance output of 0 - 100 percent.

This sensor worked as expected during this voyage.

2.5.2 WET Labs ECO CDOM Sensor

The WET Labs ECO CDOM (coloured dissolved organic matter) sensor was used for all deployments. The CDOM has been calibrated with manufacturer supplied coefficients.

This sensor worked as expected during this voyage.

2.5.3 WET Labs ECO Fluorometer-Scattering Sensor

The WET Labs ECO Fluorometer-Scattering sensor was used for all deployments. The fluorometer (Chlorophyll-*a*) has been calibrated with manufacturer supplied coefficients to give outputs in mg/m^3 ($= \mu\text{g}/\text{L}$). The scattering (optical backscatter, OBS) has been calibrated with manufacturer supplied coefficients to give volume scattering outputs in $\text{m}^{-1}\text{sr}^{-1}$.

This sensor worked as expected during this voyage.

2.5.4 Biospherical PAR Sensor

The Biospherical PAR (photosynthetically active radiation) sensor was used for all deployments. The output is a nominal 0 - 5 volts which is converted to the unit $\mu\text{Einstein}/\text{m}^2/\text{second}$ using a manufacturer supplied wet calibration factor and the dark voltage determined at calibration. This data channel has been included in the output files for all deployments. Time of day and environmental factors such as sea state and cloud cover impact these readings. If most or all of the values for a deployment are near zero it indicates a night-time cast. In deployments where the PAR profiles have sub-surface maxima the CTD may have been shaded by the ship.

This sensor worked as expected during this voyage.

2.5.5 Sea-Bird Scientific Deep SUNA V2 nitrate sensor

The Sea-Bird Scientific Deep SUNA V2 nitrate sensor was mounted on the CTD carousel base for all deployments.

This sensor worked as expected during this voyage. No SUNA data was collected on cast #1.

2.6 Bad-Data Detection

The value limits for each sensor are configured in CNV_to_Scan conversion software and are written to the NetCDF scan file. Typical limits used for the sensor range and maximum second difference are in Table 5. The rejection rate is recorded in the CapPro processing log file.

Sensor	Range minimum	Range maximum	Maximum Second Difference
Pressure	-7	6500	0.5
Temperature	-10	40	0.05
Conductivity	-0.01	7	0.01
Dissolved Oxygen	-0.1	500	0.5
Fluorometer	0	30	0.5
PAR	-5	5000	0.5
Transmissometer	0	100	0.50
Altimeter	0	50	0.5

Table 5: Sensor limits for bad-data detection

2.7 Heave Filtering

Sensor data impacted by ship heave impeding the CTD deployment is filtered out in three stages and applied during data binning. The first stage detects negative acceleration of the CTD which can cause trailing mixed water to be pumped through the sensors. The second stage looks at all negative density gradients and flags readings which are above 10 times the standard deviation of all negative gradients, for 2 seconds. The third stage flags any pressure reversals which are greater than the height of the CTD sensor pump inlet above the frame.

2.8 Temperature-Conductivity Lag

To precisely align the temperature and conductivity measurements for a sample of water a temporal offset can be applied. A manufacturer-recommended nominal offset (Δt_{c_SBE9+}) of -0.073 seconds is initially applied at time of acquisition by the SBE9+ deck unit on both primary and secondary conductivity channels. This offset advances the conductivity sensor readings in time to compensate for the amount of time it takes for the measured water sample to move from the temperature sensor through into the conductivity sensor cell.

Post-voyage inspection of the temperature and conductivity data in CapPro can determine fine-tuning adjustments to the conductivity sample time (seconds) offset (Δt_{c_CP}) that will optimally align the data. The final adjustments applied to the conductivity sample time can be found in Table 6 and Table 7. Note that although CapPro can set an offset ('lag', in number of scans, with a scan frequency of 24 Hz) for both temperature and conductivity samples, DAP only sets a lag for the conductivity sample to maintain consistency with the nominal offset applied by the SBE9+ to the conductivity data. The equation governing this conductivity sample time adjustment is given below, where $t_{c_aligned}$ is the best-estimate of the conductivity measurement time (seconds) to align it with the temperature measurement from the same sample of water on the downcast, and t_{c_means} is the original, uncorrected conductivity measurement time (seconds).

$$t_{c_aligned} = t_{c_meas} + \Delta t_{c_SBE9+} + \Delta t_{c_CP}$$

No additional T/C lags were applied in CapPro as no obvious spikes or thermocline offsets were present during the voyage. The vast majority of deployments for this voyage were in shallow waters.

Cast #	Nominal Offset Time Applied by SBE9+, Δt_{c_SBE9+} (sec)	Offset ('Cond lag') Set in CapPro (scans)	Calculated Offset Time from CapPro 'Cond lag', Δt_{c_CP} (sec = scans/24 Hz)
1-58	-0.073	0	0

Table 6: Primary conductivity sensor offset adjustments

Cast #	Nominal Offset Time Applied by SBE9+, Δt_{c_SBE9+} (sec)	Offset ('Cond lag') Set in CapPro (scans)	Calculated Offset Time from CapPro 'Cond lag', Δt_{c_CP} (sec = scans/24 Hz)
1-58	-0.073	0	0

Table 7: Secondary conductivity sensor offset adjustments

2.9 Averaging

The calibrated data were 'filtered' to remove pressure reversals and binned into the standard product of 1-decibar averaged NetCDF files. The binned values were calculated by applying a linear, least-squares fit as a function of pressure to the sensor data for each bin, using this to interpolate the value for the bin mid-point. This method is used to avoid possible biases which would result from averaging with respect to time.

Each binned parameter is assigned a quality control (QC) flag (also in the NetCDF files). Our QC flagging scheme is described in (Pender & NCMI Information & Data Centre, 2022).

The QC Flag for each bin is estimated from the values for the bin components. The QC Flag for derived quantities, such as salinity and dissolved oxygen, is taken to be the worst of the estimates for the parameters from which they are derived.

3 References

Bostock. (2026). *The RV Investigator. Voyage Plan IN2026_V04*. Retrieved from Marine National Facility: Voyage Plans and summaries:
https://www.cmar.csiro.au/data/reporting/get_file.cfm?eov_pub_id=3927

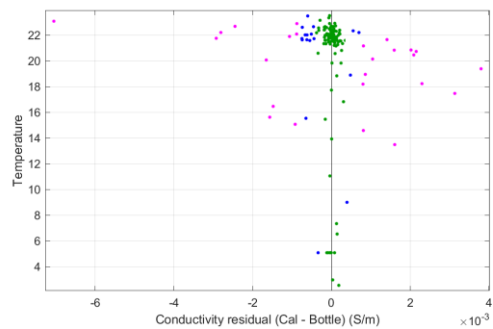
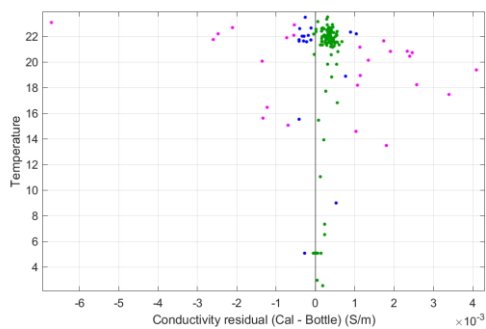
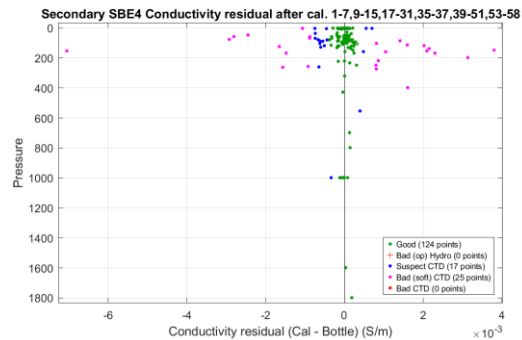
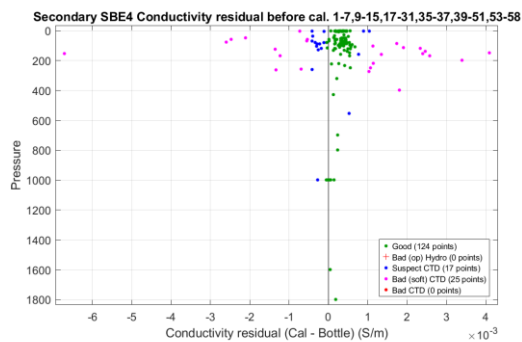
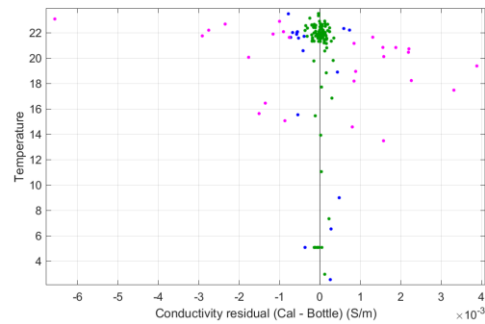
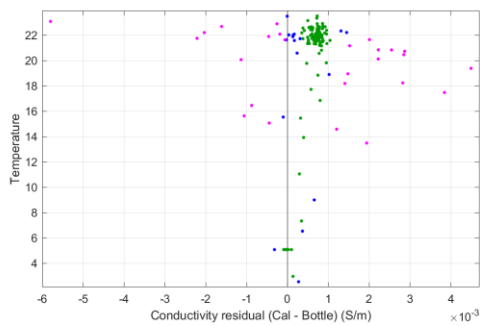
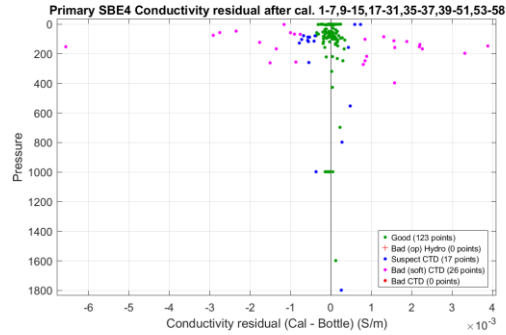
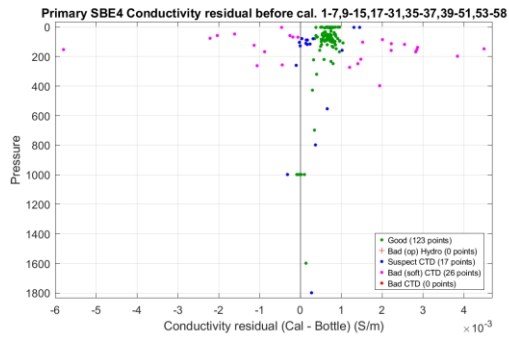
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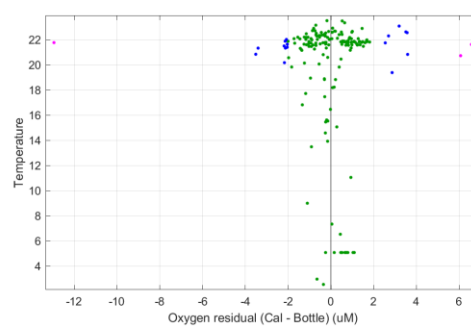
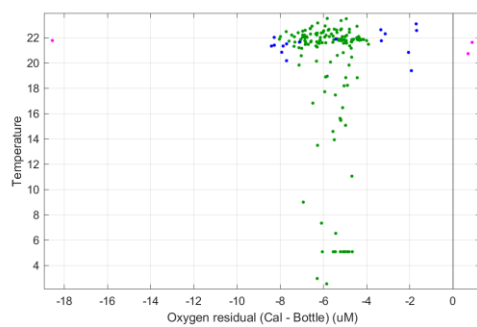
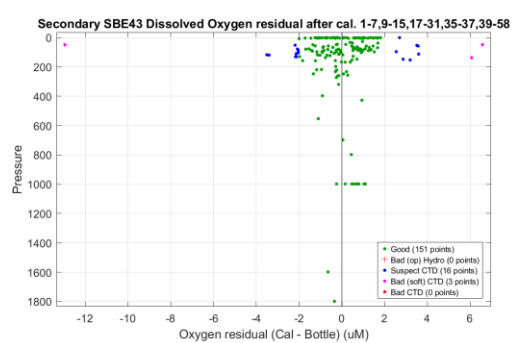
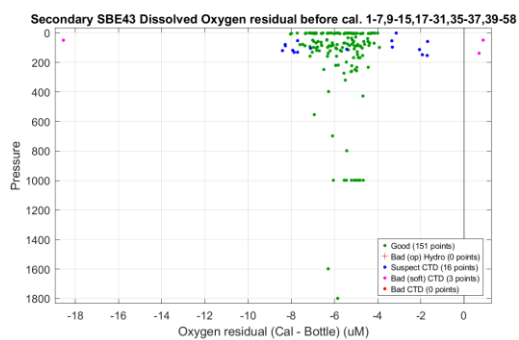
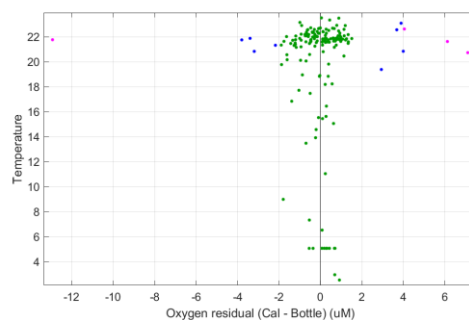
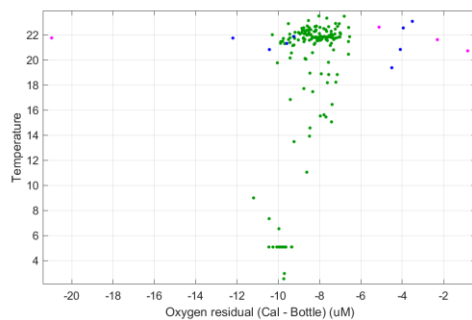
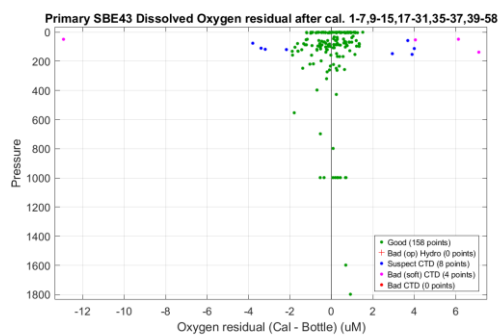
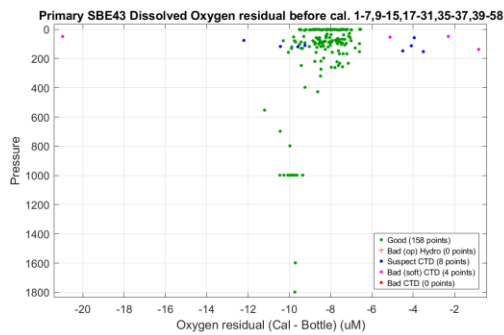
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4 Appendices

A.1 Conductivity Calibration Residual Plots



A.2 Dissolved Oxygen Calibration Residual Plots



A.3 CTD Deployment Summary

FILENAME	CAST START DATE	CAST END DATE	Hours	START LAT	START LON	STATI ON DRIFT (m)	Temp S/N	Cond S/N	DO S/N	MAX DEPHT (m)
in2026_v04001Ctd.nc	29/07/2026 00:13	29/07/2026 01:04	0.8	-23.697029	153.703552	291.8	[6180, 5932]	[3868, 3168]	[4167, 4188]	1001.5
in2026_v04002Ctd.nc	29/07/2026 20:08	29/07/2026 20:36	0.5	-22.367155	152.309052	109	[6180, 5932]	[3868, 3168]	[4167, 4188]	99.7
in2026_v04003Ctd.nc	30/07/2026 20:27	30/07/2026 20:49	0.4	-22.397583	152.046204	22.5	[6180, 5932]	[3868, 3168]	[4167, 4188]	87.9
in2026_v04004Ctd.nc	31/07/2026 01:07	31/07/2026 01:32	0.4	-22.267357	151.818863	27	[6180, 5932]	[3868, 3168]	[4167, 4188]	73.3
in2026_v04005Ctd.nc	31/07/2026 03:14	31/07/2026 03:36	0.4	-22.357552	151.914627	89.3	[6180, 5932]	[3868, 3168]	[4167, 4188]	77.8
in2026_v04006Ctd.nc	31/07/2026 06:01	31/07/2026 06:19	0.3	-22.249022	152.102356	42.8	[6180, 5932]	[3868, 3168]	[4167, 4188]	92.5
in2026_v04007Ctd.nc	31/07/2026 08:09	31/07/2026 08:25	0.3	-22.200033	152.004852	33.7	[6180, 5932]	[3868, 3168]	[4167, 4188]	89.8
in2026_v04008Ctd.nc	31/07/2026 10:35	31/07/2026 10:50	0.2	-22.282026	151.955582	127.9	[6180, 5932]	[3868, 3168]	[4167, 4188]	86.9
in2026_v04009Ctd.nc	31/07/2026 12:16	31/07/2026 12:31	0.3	-22.351994	151.915085	151.3	[6180, 5932]	[3868, 3168]	[4167, 4188]	80
in2026_v04010Ctd.nc	31/07/2026 20:32	31/07/2026 20:53	0.4	-22.538006	152.189621	15.6	[6180, 5932]	[3868, 3168]	[4167, 4188]	88.4
in2026_v04011Ctd.nc	1/08/2026 10:50	1/08/2026 11:07	0.3	-22.157221	151.951233	148.4	[6180, 5932]	[3868, 3168]	[4167, 4188]	90.1
in2026_v04012Ctd.nc	2/08/2026 02:11	2/08/2026 02:30	0.3	-22.105911	152.095642	26.7	[6180, 5932]	[3868, 3168]	[4167, 4188]	88.4
in2026_v04013Ctd.nc	2/08/2026 09:46	2/08/2026 10:01	0.3	-22.668831	151.77356	32.7	[6180, 5932]	[3868, 3168]	[4167, 4188]	62.1
in2026_v04014Ctd.nc	3/08/2026 03:27	3/08/2026 03:45	0.3	-22.654905	151.909546	64.3	[6180, 5932]	[3868, 3168]	[4167, 4188]	60.1
in2026_v04015Ctd.nc	3/08/2026 06:14	3/08/2026 06:40	0.4	-22.683954	152.139572	63.3	[6180, 5932]	[3868, 3168]	[4167, 4188]	79
in2026_v04016Ctd.nc	3/08/2026 09:35	3/08/2026 09:51	0.3	-22.776136	152.08902	20.2	[6180, 5932]	[3868, 3168]	[4167, 4188]	81.4
in2026_v04017Ctd.nc	3/08/2026 11:35	3/08/2026 11:52	0.3	-22.939447	152.073944	81.2	[6180, 5932]	[3868, 3168]	[4167, 4188]	113.1
in2026_v04018Ctd.nc	4/08/2026 13:06	4/08/2026 13:30	0.4	-23.059265	152.138245	54.8	[6180, 5932]	[3868, 3168]	[4167, 4188]	126.5
in2026_v04019Ctd.nc	4/08/2026 22:36	4/08/2026 23:03	0.5	-23.043999	152.024918	77.7	[6180, 5932]	[3868, 3168]	[4167, 4188]	106.6
in2026_v04020Ctd.nc	5/08/2026 05:58	5/08/2026 06:13	0.2	-23.035803	151.950455	32.8	[6180, 5932]	[3868, 3168]	[4167, 4188]	66.7
in2026_v04021Ctd.nc	5/08/2026 20:04	5/08/2026 20:32	0.5	-22.93626	152.161713	33.4	[6180, 5932]	[3868, 3168]	[4167, 4188]	117.8
in2026_v04022Ctd.nc	7/08/2026 11:33	7/08/2026 12:07	0.6	-23.656195	152.5802	89.1	[6180, 5932]	[3868, 3168]	[4167, 4188]	323.3
in2026_v04023Ctd.nc	7/08/2026 14:48	7/08/2026 15:22	0.6	-23.721384	152.486984	29.6	[6180, 5932]	[3868, 3168]	[4167, 4188]	259.5
in2026_v04024Ctd.nc	7/08/2026 16:34	7/08/2026 16:55	0.4	-23.78681	152.397507	35.7	[6180, 5932]	[3868, 3168]	[4167, 4188]	52.2
in2026_v04025Ctd.nc	8/08/2026 02:08	8/08/2026 02:46	0.6	-23.252115	153.124237	43.6	[6180, 5932]	[3868, 3168]	[4167, 4188]	430.4
in2026_v04026Ctd.nc	8/08/2026 16:17	8/08/2026 16:39	0.4	-22.55253	152.778763	25.6	[6180, 5932]	[3868, 3168]	[4167, 4188]	80.2
in2026_v04027Ctd.nc	8/08/2026 17:52	8/08/2026 18:17	0.4	-22.424631	152.71579	26.3	[6180, 5932]	[3868, 3168]	[4167, 4188]	105.2
in2026_v04028Ctd.nc	8/08/2026 19:27	8/08/2026 19:51	0.4	-22.331875	152.791809	10.4	[6180, 5932]	[3868, 3168]	[4167, 4188]	101.7
in2026_v04029Ctd.nc	9/08/2026 10:31	9/08/2026 10:51	0.3	-22.28817	152.882233	26.7	[6180, 5932]	[3868, 3168]	[4167, 4188]	93.2

in2026_v04030Ctd.nc	9/08/2026 18:36	9/08/2026 19:07	0.5	-21.986261	153.607147	17	[6180, 5932]	[3868, 3168]	[4167, 4188]	236
in2026_v04031Ctd.nc	10/08/2026 22:03	10/08/2026 22:23	0.3	-22.424309	152.621841	35.2	[6180, 5932]	[3868, 3168]	[4167, 4188]	84.6
in2026_v04032Ctd.nc	10/08/2026 23:13	10/08/2026 23:31	0.3	-22.491074	152.642212	26	[6180, 5932]	[3868, 3168]	[4167, 4188]	95.2
in2026_v04033Ctd.nc	11/08/2026 00:08	11/08/2026 00:25	0.3	-22.549417	152.676834	17.5	[6180, 5932]	[3868, 3168]	[4167, 4188]	78.5
in2026_v04034Ctd.nc	11/08/2026 01:03	11/08/2026 01:21	0.3	-22.608309	152.712357	25.5	[6180, 5932]	[3868, 3168]	[4167, 4188]	80.9
in2026_v04035Ctd.nc	11/08/2026 02:06	11/08/2026 02:31	0.4	-22.671953	152.732498	18.9	[6180, 5932]	[3868, 3168]	[4167, 4188]	123.7
in2026_v04036Ctd.nc	11/08/2026 03:23	11/08/2026 03:51	0.5	-22.613005	152.789154	56.4	[6180, 5932]	[3868, 3168]	[4167, 4188]	122.8
in2026_v04037Ctd.nc	11/08/2026 07:28	11/08/2026 07:46	0.3	-22.827576	152.644577	13.9	[6180, 5932]	[3868, 3168]	[4167, 4188]	134.4
in2026_v04038Ctd.nc	11/08/2026 08:37	11/08/2026 08:54	0.3	-22.850712	152.66301	16.8	[6180, 5932]	[3868, 3168]	[4167, 4188]	146.8
in2026_v04039Ctd.nc	11/08/2026 09:23	11/08/2026 09:44	0.3	-22.87072	152.679321	18.2	[6180, 5932]	[3868, 3168]	[4167, 4188]	170.3
in2026_v04040Ctd.nc	11/08/2026 10:37	11/08/2026 11:05	0.5	-22.900021	152.704208	103.9	[6180, 5932]	[3868, 3168]	[4167, 4188]	263.5
in2026_v04041Ctd.nc	12/08/2026 00:24	12/08/2026 00:52	0.5	-22.745438	152.539413	27.6	[6180, 5932]	[3868, 3168]	[4167, 4188]	123.8
in2026_v04042Ctd.nc	12/08/2026 02:46	12/08/2026 03:06	0.3	-22.570646	152.378952	218.6	[6180, 5932]	[3868, 3168]	[4167, 4188]	89.9
in2026_v04043Ctd.nc	12/08/2026 10:49	12/08/2026 11:16	0.4	-22.686174	152.330109	22.8	[6180, 5932]	[3868, 3168]	[4167, 4188]	106.2
in2026_v04044Ctd.nc	12/08/2026 23:54	13/08/2026 00:17	0.4	-22.409435	152.525436	25.9	[6180, 5932]	[3868, 3168]	[4167, 4188]	98.4
in2026_v04045Ctd.nc	13/08/2026 14:20	13/08/2026 14:46	0.4	-22.891575	152.717545	68.6	[6180, 5932]	[3868, 3168]	[4167, 4188]	264.8
in2026_v04046Ctd.nc	13/08/2026 17:37	13/08/2026 18:05	0.5	-22.711035	152.81369	58.9	[6180, 5932]	[3868, 3168]	[4167, 4188]	133.1
in2026_v04047Ctd.nc	13/08/2026 18:43	13/08/2026 19:14	0.5	-22.75049	152.843719	56.7	[6180, 5932]	[3868, 3168]	[4167, 4188]	161.3
in2026_v04048Ctd.nc	13/08/2026 19:48	13/08/2026 20:19	0.5	-22.791704	152.876251	48.4	[6180, 5932]	[3868, 3168]	[4167, 4188]	225
in2026_v04049Ctd.nc	14/08/2026 12:31	14/08/2026 12:48	0.3	-23.381521	152.104248	29.3	[6180, 5932]	[3868, 3168]	[4167, 4188]	51.8
in2026_v04050Ctd.nc	14/08/2026 16:29	14/08/2026 17:20	0.9	-23.327808	152.180756	221.1	[6180, 5932]	[3868, 3168]	[4167, 4188]	222.9
in2026_v04051Ctd.nc	14/08/2026 18:19	14/08/2026 18:51	0.5	-23.263323	152.139557	50.2	[6180, 5932]	[3868, 3168]	[4167, 4188]	160.7
in2026_v04052Ctd.nc	14/08/2026 19:40	14/08/2026 20:04	0.4	-23.23778	152.123917	41.5	[6180, 5932]	[3868, 3168]	[4167, 4188]	133.9
in2026_v04053Ctd.nc	15/08/2026 09:52	15/08/2026 10:08	0.3	-22.267523	152.214111	31.3	[6180, 5932]	[3868, 3168]	[4167, 4188]	95.5
in2026_v04054Ctd.nc	15/08/2026 10:52	15/08/2026 11:10	0.3	-22.208204	152.244568	22.8	[6180, 5932]	[3868, 3168]	[4167, 4188]	90
in2026_v04055Ctd.nc	15/08/2026 11:57	15/08/2026 12:11	0.2	-22.151846	152.273087	9.5	[6180, 5932]	[3868, 3168]	[4167, 4188]	84.3
in2026_v04056Ctd.nc	17/08/2026 03:23	17/08/2026 03:38	0.3	-23.536715	152.164886	47.8	[6180, 5932]	[3868, 3168]	[4167, 4188]	55.7
in2026_v04057Ctd.nc	17/08/2026 17:35	17/08/2026 18:15	0.7	-23.510948	153.282043	222.3	[6180, 5932]	[3868, 3168]	[4167, 4188]	556.4
in2026_v04058Ctd.nc	18/08/2026 11:58	18/08/2026 13:59	2	-24.180872	153.638336	159.3	[6180, 5932]	[3868, 3168]	[4167, 4188]	1801.4

Table 8: Summary of CTD deployments

As Australia's national science agency and innovation catalyst, CSIRO is solving the greatest challenges through innovative science and technology.

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